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| 14. ABSTRACT The Annual Review of Research contains reports on collaborative research conducted at the National Center for Food Safety and Technology during the fiscal year 2011 (October 1, 2010 through September 30, 2011). NCFST's research is implemented through science platforms that reflect the organization's expertise: food processing and packaging, food microbiology, chemical contaminants and allergens, nutrition, and proficiency testing and method validation programs. The NCFST seeks to build on its strong foundation and history of the collaboration with | | | |
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Report Title

NCFST/IFSH US Army Project Interim Report August 31 2012

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NCFST/IFSH US Army Project Interim Report Aug 31, 2012

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The Annual Review of Research contains reports on collaborative research conducted at the National Center for Food Safety and Technology during the fiscal year 2011 (October 1, 2010 through September 30, 2011). NCFST's research is implemented through science platforms that reflect the organization's expertise: food processing and packaging, food microbiology, chemical contaminants and allergens, nutrition, and proficiency testing and method validation programs. The NCFST seeks to build on its strong foundation and history of the collaboration with industry, FDA and academia to increase its research portfolio and expand its partnership with its stakeholders. By conducting important research on critical food processing issues to address food safety and nutrition, NCFST can help improve the health and well being of the public.

PUBLICATIONS

(a) Papers published in peer-reviewed journals (total 26)

1. Albillos, Silvia. M., Al-Taher, Fadwa and Maks, Nicole. 2011. Increasing extractability of protein for allergen detection after food processing. *Food Chemistry*. 127(4):1831-1834.
2. Anderson, N.M., J.W. Larkin, M.B. Cole, G.E. Skinner, R.C. Whiting, L.G.M. Gorris, A. Rodriguez, R. Buchanan, C.M. Stewart, J. H. Hanlin, L. Keener, and P. A. Hall. 2011. The Food Safety Objective Approach for Controlling *Clostridium botulinum* Growth and Toxin Production in Commercially Sterile Foods. *Journal of Food Protection*. 74(11):1956-89.
3. Anderson, N.M. and P.N. Walker. 2011. Quality Comparison of Continuous Steam Sterilization Segmented-Flow Aseptic Processing versus Conventional Canning of Whole and Sliced Mushrooms. *Journal of Food Science* 76(6):E429-437.
4. Demirci, A. and K. Krishnamurthy. 2011. Pulsed ultraviolet light. In [Nonthermal Processing Technologies for Food](#). Zhang, H., G. Barbosa-Cánovas, V.M. Balasubramaniam, P. Dunne, D. Farkas, and J. Yuan, eds. Ames, Iowa: Blackwell Publishing. ISBN: 0813816688, pp. 249-261.
5. Duncan, Timothy V. 2011. Applications of Nanotechnology in Food Packaging and Food Safety: Barrier Materials, Antimicrobials and Sensors. *Journal of Colloid and Interface Science*. 363, 1-24.

6. Duncan, Timothy V. 2011. The communication challenges presented by nanofoods. *Nature Nanotechnology*. 6: 683-688.
7. Edirisinghe, Indika, Banaszewski, Katarzyna, Cappozzo, Jack, Krishnankutty, Sandhya, Ellis, CollinL, Tadapaneni, Ravi, Kappagoda, Chulani T, Burton-Freeman, Britt M. 2011. Strawberry anthocyanin and its association with postprandial inflammation and insulin. *British Journal of Nutrition*. 106 (6): 913-922.
8. Edirisinghe, Indika, Banaszewski, Katarzyna, Cappozzo, Jack, McCarthy, D. Burton-Freeman, Brit. 2011. Effect of black currant anthocyanins on the activation of endothelial nitric oxide synthase (eNOS) in vitro in human endothelial cells. *Journal of Agricultural and Food Chemistry*. 59(16): 8616-24.
9. Ellis CL, Edirisinghe, I, Kappagoda, T, Burton-Freeman, B. 2011. Attenuation of Meal-Induced Inflammatory and Thrombotic Responses in Overweight Men and Women After 6-Week Daily Strawberry (*Fragaria*) Intake: a Randomized Placebo-Controlled Trial. *Journal of Atherosclerosis and Thrombosis*. Vol. 18 (4): 318-327.
10. Grasso, E.M., R.M. Uribe-Rendon. 2011. Inactivation of *Escherichia coli* inoculated onto fresh-cut chopped cabbage using electron-beam processing. *Journal of Food Protection*. 74(1):115-118.
11. Jia Wen, Xiangyu Deng, Zengxin Li, Edward G. Dudley, Ramaswamy C. Anantheswaran, Stephen J. Knabel, Wei Zhang. 2011. Transcriptomic response of isteria monocytopigenes during transition to the long term survival phase. *Applied and Environmental Microbiology* 77(17):5966-5972.
12. Jackson, L.S., Jablonski, J., Bullerman, L.B.; Bianchini, A., Hanna, M.A., Voss, K.A., Hollub, A.D. and D. Ryu. 2011. Reduction of fumonisin B1 in corn grits by twin-screw extrusion. *Journal of Food Science*. 76(6), T150-T155.
13. Kaiping Deng, Siyun Wang, Xiaoqian Rui, Wei Zhang, Mary Lou Tortorello. 2011. Functional analysis of *ycfR* and *ycfQ* in *Escherichia coli* O157:H7 linked to outbreaks of illness associated with fresh produce. *Applied and Environmental Microbiology* 77(12): 3952-3959.
14. Ilic, S., A. Rajić, C.J. Britton, E. Grasso, W. Wilkins, S. Totton, B. Wilhelm, L. Waddell, J.T. LeJeune. 2011. A scoping study characterizing prevalence, risk factor and intervention research, published between 1990 and 2010, for microbial hazard in leafy green vegetables. *Food Control*. 23(1):7-19.
15. Krishnamurthy, K. and J. Sneed. 2011. Cooling practices used in school foodservice. *Food Protection Trends*. 31(12):828-833.

16. Laird, David T, Yan Sun, Karl F. Reineke, Y. Carol Shieh. 2011. Effective hepatitis A virus inactivation during low-heat dehydration of contaminated green onions. *Food Microbiology*. 28(5): 998-1002.
17. Pina M. Fratamico, Siyun Wang, Xianghe Yan, Wei Zhang, Yuesheng Li. 2011. Differential gene expression of *Escherichia coli* O157:H7 in ground beef extract compared to tryptic soy broth. *Journal of Food Science*. 76 (1): M79-87.
18. Spinak, S.H. and J.W. Larkin. 2011. Regulations and alternative food-processing technologies. In Nonthermal Processing Technologies for Food. Zhang, H., G. Barbosa-Cánovas, V.M. Balasubramaniam, P. Dunne, D. Farkas, and J. Yuan, eds. Ames, Iowa: Blackwell Publishing. ISBN: 0813816688, pp. 562-570.
19. Ramaswamy, R., K. Krishnamurthy and S. Jun. 2012. Food decontamination by infrared heating. In *Food Decontamination: Novel Methods and Applications*. Edited by M. Ngadi and A. Demirci. Woodhead publishing.
20. Sui, Q., Roginski, H., Williams, R., Versteeg, C., & Wan, J. (2011). Effect of pulsed electric field and thermal treatments on the physicochemical and functional properties of whey protein isolate. *International Dairy Journal* 21 (4), 206-213.
21. Sui, Q., Roginski, H., Williams, R., Wooster, T., Versteeg, C., & Wan, J. (2011). Effect of ionic strength of pulsed electric field treatment medium on the physicochemical and structural characteristics of lactoferrin. *Journal of Agricultural and Food Chemistry* 58 (22), 11725–11731.
22. Voss, K.A.; Riley, R.T.; Jackson, L.S.; Jablonski, J.E.; Bianchini, A.; Bullerman, L.B.; Hanna, M.A. and D. Ryu. 2011. Extrusion cooking with glucose supplementation of fumonisin-contaminated corn grits protects against nephrotoxicity and disrupted sphingolipid metabolism in rats. *Molecular Nutrition & Food Research*. 55, 1-9
23. Wei Zhang, Joseph Wade, Edward Dudley. 2011. Genomic and transcriptomic analysis of foodborne bacterial pathogens. In: *Genomics of Foodborne Bacterial Pathogens, Food Microbiology and Food Safety Series*. Wei Zhang, Martin Wiedmann (eds.). Springer. ISBN 978-4419-7685-7, Chapter 10.
24. Xiangyu Deng, Zengxin Li, Wei Zhang. 2011. Transcriptome sequencing of *Salmonella enterica* serovar Enteritidis under desiccation and starvation stress in peanut oil. *Food Microbiology*. 30 (1): 311-315.
25. Yang, W.W. N.R. Mwakatage, R.Goodrich-Schneider, K. Krishnamurthy, T.M. Rababah. 2011. Mitigation of major peanut allergens by pulsed ultraviolet light. *Food and Bioprocess Technologies*. Published online: 03 June 2011. DOI: 10.1007/s11947-011-0615-6.

26. Yingshu He, Dongjing Guo, Jingyun Yang, Mary Lou Tortorello, Wei Zhang. 2011. Survival and heat resistance of *Salmonella enterica* and *Escherichia coli* O157:H7 in peanut butter. *Applied and Environmental Microbiology*. 77(23):8434-8.

(b) Papers published in non-peer-reviewed journals or in conference proceedings (0)

(c) Presentations (total 15)

Institute of Food Technologists (IFT) Conference – June 2012

1. Kunni Wei, Tong-Jen Fu. 2012. *In Vitro* Cellular Assays for Assessing the Impact of Processing on the Allergenic Potential of Egg Allergens.
2. Shuopeng Yang, Tong-Jen Fu. 2012. Evaluation of ELISA Test Kits for the Detection of Milk Residues in Commercial Food Products.
3. Mingming Li, Stephen Grove, Heng Zhao, Mingming Li. 2012. Norovirus Transfer during Preparation of Fresh Produce.
4. Jingxin Guo, Greg Fleischman. 2012. Temperature Profile through the Shell of Eggs Heated by Infrared Energy.
5. Elizabeth M. Grasso, Lindsay A. Halik, Stephen Grove, Yue Zheng, Fletcher Arritt, Susanne E. Keller. 2012. Cleaning and Sanitation of *Salmonella*-Contaminated Peanut Butter Processing Equipment.
6. Heng Zhao, Stephen Grove, Mingming Li, Alvin Lee. 2012. Norovirus Transfer on Contact Surfaces during Preparation of Fresh Produce.
7. Wenjing Li, Yang Chen, Ravinder Reddy. 2012. Development of a HPLC Method for Simultaneous Determination of Vitamin A and D in Milk and Milk Products.
8. Meng Xu, Tong-Jen Fu. 2012. Exploring the Thermal Resistance of Food Allergens.
9. Qishuo Na, Susanne E. Keller. 2012. Survival of *Salmonella* during Drying and Storage of Ginger, Onion and Garlic.

International Association for Food Protection (IAFP) Conference – July 2012

1. Mingming Li, Stephen F Grove, Heng Zhao, Alvin Lee. 2012. Norovirus Transfer during Chopping of Romaine Lettuce.
2. Songchuan Ma, , Diana S. Stewart, Joseph E. Schlesser, Carol Shieh, Mary L. Tortorello, Arlette G. Shazer. 2012. Optimization and Characterization of an Integrated Cell Culture-PCR Assay for the Detection of *Coxiella burnetti* Nine Mile in Whole Milk.

3. Hanshuai Zhang, Tong-Jen Fu. 2012. Minimizing *Salmonella* Contamination in Sprouts by Controlling the Germination Temperature.
4. Qian Wang, Lacey Guillen, Don H. Bark, Carlos Abeyta, Greg Gharst. 2012. Evaluation of a Revised U.S. Food and Drug Administration Method for the Detection of *Campylobacter jejuni* and *coli* from Raw Silo Milk.
5. Heng Zhao, Stephen F. Grove, Mingming Li, Alvin Lee. 2012. Norovirus Transfer between Hands and Fresh Produce.

The Association for Microbiology (ASM) Conference Student Presentations- June 2012

1. Xueyan Wang, Y. Caol Shieh. 2012. Survival of Viruses on Strawberry during Freeze-dry Dehydration.

GRADUATE STUDENTS SUPPORTED

| Name | Percent Supported |
|-------------------------------|-------------------|
| <i>Master Degree Students</i> | |
| Agarwal, Sagar | 0.19 |
| Apelagunta, Vinil | 0.19 |
| Bedford, Binu | 0.19 |
| Bhaskara, Anuhya Goutham | 0.19 |
| Bima, Yige | 0.19 |
| Chen, Zhengzai, | 0.19 |
| Feng, Haoshi (Hanna) | 0.19 |
| Fu, Xiaowen | 0.19 |
| Han, Yibin | 0.19 |
| Jin, Zhen | 0.19 |
| Li, Mingming | 0.19 |
| Li, Wenjing | 0.19 |
| Lu, Jieling | 0.19 |
| Ma, Songchuan | 0.19 |
| Mehta, Devanshu | 0.19 |
| Na, Qishuo | 0.19 |
| Nekkanti, Sanjana | 0.19 |
| Rangaswamy Iyangar,Ramya | 0.19 |
| Sun, Shenqian, | 0.19 |
| Vijayakumar, Lakshmi Prabha | 0.19 |
| Wang, Jingbo | 0.19 |
| Wang, Xue | 0.19 |
| Wang, Xueyan | 0.19 |
| Wei, Hequin | 0.19 |
| Wei, Kunni | 0.19 |
| Wu, Zhuchun | 0.19 |
| Xu, Jianwen | 0.19 |

| | |
|-----------------|------|
| Xu, Ruoyang | 0.19 |
| Xu, Meng | 0.19 |
| Yang, Fei | 0.19 |
| Yang, Shuopeng | 0.19 |
| Yang, Si | 0.19 |
| Yen, Lihan | 0.19 |
| Zang, Mingxia | 0.19 |
| Zhang, Hanshuai | 0.19 |
| Zhang, Xi | 0.19 |
| Zhao, Heng | 0.19 |
| Zhao, Yuhui | 0.19 |
| Zhao, Kun | 0.19 |
| Zheng Jiaojie | 0.19 |
| Zheng, Yue | 0.19 |
| Zhou, Chao | 0.19 |

FTE Equivalent: 7.79

Total Master Degree student number: 41

Ph.D. Students

| | |
|---|------|
| Salazar, Joelle (Biology Ph.D. Student) | 0.19 |
| Shim, Ji- Young (ChBE Ph.D. Student) | 0.19 |
| FTE Equivalent: 0.38 | |
| Total Ph.D. degree student number: | 2 |

Masters Degrees Awarded

| |
|------------------------------|
| Ahuja, Rameet J. |
| Aluri, Bharat |
| Banstola, Anunaya |
| Bedford, Binaifer S. |
| Bellamkonda Sudhakar, Sujith |
| Chadha, Isha |
| Chen, Fei |
| Depa, Keshava Reddy |
| Du, Qian |
| Farahi, Jason |
| Feng, Haoshi |
| Gera, Mohit |
| Hutson, Craig |
| Kalle, Niranjan |
| Kanneganti, Bhargavi |
| Kukreja, Ankush |
| Li, Yichen |
| Lu, Yin |
| Lu, Yingshuang |
| Lou, Yuqian |

Mallory, Emily
Mann, Khushdeep K.
Patel, Kanisha K.
Patel, Vinalben
Ren, Yan
Sandhya, Krishnankutty
Soehrmann, Scott
Suriyanarayanan, Annamalai
Vendemio, Philip C.
Wang, Peng
Wang, Yang
Yuan, Wen

Total Number: 32

FACULTY

| Name | Percent Supported | National Academy Member |
|-----------------------|-------------------|-------------------------|
| Brackett, Robert | 0.83 | Yes |
| Cappozzo, Jack | 0.13 | No |
| Freeman, Britt Burton | 0.10 | No |
| Grove, Stephen | 0.95 | No |
| Krishnamurthy, Kathir | 0.80 | No |
| Lee, Alvin | 0.89 | No |
| Wan, Jason | 0.91 | No |
| Wasan, Darsh | 0.17 | Yes |

FTE Equivalent: 4.78

Total Number: 8

Other Research Staff

| Name | Percent Supported |
|-------------------------|-------------------|
| Al-Taher, Fadwa | 0.68 |
| Banaszewsk, Katarzyna | 0.12 |
| Chen, Yang | 0.88 |
| Conway, Chris | 0.92 |
| Dugan, Shannon | 0.92 |
| Eberhardt, Edward | 1.00 |
| Ginty, Patrick | 0.13 |
| Griesemer, David | 0.17 |
| Guillen, Laceyl | 0.92 |
| Juergensmeyer, Margaret | 0.94 |
| Juskelis, Rima | 0.13 |
| Karczewski, Michael | 0.13 |

| | |
|---------------------|------|
| Koschetz, Cindy | 0.70 |
| Loeza, Viviana | 0.82 |
| Maks-Warren, Nicole | 1.00 |
| Neuman, Barbara | 0.10 |
| Paradis, Armand | 0.25 |
| Patazca, Eduardo | 0.66 |
| Perez, Ismael | 0.93 |
| Steiner, Ed | 1.00 |
| Stephens, LaShondra | 0.67 |
| Urbancyk, Michael | 1.00 |
| Velarde, Osvaldo | 0.61 |

FTE Equivalent: 14.67

Total Number: 23

SCIENTIFIC PROGRESS AND ACCOMPLISHMENTS

The National Center for Food Safety and Technology (NCFST) is a food research consortium of the US Food and Drug Administration's Center for Food Safety and Applied Nutrition (FDA/CFSAN), the Illinois Institute of Technology (IIT), and the food industry. Established 23 years ago, the National Center brings together the expertise of these three sectors for the purpose of enhancing and improving the safety of the food for US consumers. Since 2007, the Center has applied its proven collaborative model to the area of health promoting foods and the development of food-based solutions for improving public health and reducing disease risk through science.

NCFST is a primary research center within the new Institute for Food Safety and Health (IFSH). Research conducted at NCFST addresses the food safety implications of emerging technologies in food processing and packaging and supports the development of safe food with health-promoting properties from farm to fork. This research forms a scientific basis for policy decisions affecting food safety and public health. Development and coordination of NCFST's scientific research program is undertaken through science platforms. Factors considered in the formation of these platforms are: alignment with FDA priorities and strategy; current and future food industry issues; growth potential for the area; opportunities for leveraged research; synergies with IIT; fit with NCFST's unique research capabilities; availability of the necessary expertise, resources and facilities to support the platform; and interest in the project on the part of all the stakeholders.

The collaborative research in food safety and health is managed by the Science Forum, and through the following 5 Research Platform:

The Microbiology Platform aims to contribute knowledge about the existence of microorganisms in foods and processing environments in support of food contamination risk assessment and management.

The Processing and Packaging Platform aims to provide a scientific basis for the processing and production of safe food by the US food industry and its global operations with the goal of ensuring and improving public health. The platform supports programs related to pasteurization, extended shelf life and sterilization, package integrity and migration of contaminants.

The Food Chemistry Platform aims to investigate the effects of food processing steps to prevent, reduce or mitigate the formation of hazardous contaminants during processing, and to prevent, reduce or mitigate the cross-transfer of pre-formed natural toxins or allergens and man-made (environmental) contaminants in the food production environment.

The Nutrition Platform aims to provide knowledge on how traditional and novel processing strategies impact the nutritional quality of foods, including bioavailability and bioactivity of nutritional components in biological systems when consumed.

The Proficiency Testing Research Platform NCFST has recently established a Proficiency Testing Research Platform aims to provide underpinning science for the development of methodologies and microbiological and chemical proficiency testing systems.

The research outcomes of the projects in each Platform have been compiled into an Annual Review of Research document, which is accessible on the IFSH website (<http://www.iit.edu/ifsh>) through the members section.